UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF AGRICULTURAL AND INDUSTRIAL CHEMISTRY
Washington 25, D. C.

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BUREAU MEMORANDUM 415

New Uses and Better Markets for Farm Products

TO ALL PERSONNEL, BUREAU OF AGRICULTURAL AND INDUSTRIAL CHEMISTRY

Our Bureau has made striking progress during the past year in research on the utilization of farm commodities. Bureau scientists and technicians have developed new and improved products from things the farmer grows, found better ways to preserve and process foods, and made possible wider use of farm crops and byproducts as industrial raw materials. This work is helping to expand agricultural markets, to advance scientific knowledge, and to raise American standards of living.

We all have a share in these achievements. But how much do we know about them? The Bureau is a large organization, and each of us has some difficulty keeping up with what is going on outside his own particular field. There are now about 1600 Bureau employees in the four Regional Research Laboratories, in our seven separate divisions and nine field stations in various parts of the country, and in the Washington office. We work in shops and offices, as well as in laboratories. And our research program includes more than 350 different projects.

I am sure that many of you would like to know more about recent Bureau accomplishments. With this in mind, I have had summarized in the pages attached sixteen of our developments that have gone into commercial use during the past year. There are a number of other Bureau developments, now being evaluated on an industrial scale, that have not been included in the list. I believe you will find these brief accounts of our research interesting and instructive, and I hope they will give you a broader understanding of what the Bureau's work means to American agriculture and to the entire nation.

G. E. Hilbert
Chief of Bureau

Attachment

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NEW USES AND BETTER MARKETS FOR FARM PRODUCTS

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Recent important achievements by the Bureau of Agricultural and Industrial Chemistry to extend the uses for farm-grown commodities through chemical and engineering research. The developments described briefly here include only those adopted by industry for commercial production during the past year.
Prepared April 15, 1949.

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Full-Flavored Frozen Citrus Purees Make Fine Desserts

Lemon and orange purees, made from whole fresh fruit and preserved by freezing, are now on the market in Los Angeles, New York, Washington, and other cities. They give full natural flavor to sherbets, ices, and pies. These smooth and tasty purees provide citrus growers with a promising new outlet, particularly for fruit that is too ripe for shipping, undersized, or has some blemish on the peel. A development of the Los Angeles laboratory.*

Fiber from Corn Protein Is New Industrial Product

A new textile fiber spun from zein, a corn protein, is now in commercial production. One firm has been making it since May 1948. About 15% of the output is used in a well known brand of men's hats. This zein fiber, blended with other fibers -- cotton, wool, rayon -- gives fabrics with desirable new qualities for clothing and other uses. It is the best fiber so far developed from a plant protein and is the only such fiber now on the market. This new product from corn is similar to wool in softness and warmth. Like all protein fibers it is somewhat weak when wet, but its dry strength (twice the wet strength) is equal to that of wool. A development of NRRL.*

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* See last page for full names of laboratories and key to abbreviations.

Simple Dye Test Aids Cotton Mills

Cotton fibers look like very fine hairs. Actually they are tiny tubes, hollow inside. Fibers from immature cotton have thinner walls than those of fully matured cotton. And they behave differently in some cotton-processing operations -- for instance, they won't dye the same as mature fibers. Unless they are specially handled, immature fibers tend to cause trouble in cotton mills. A convenient means was needed to aid in segregating bales containing a high proportion of immature cotton. Bureau scientists developed a simple dye test to do this job effectively at little cost. Samples of cotton from the bales are dipped in a special dye mixture; the immature cotton dyes green, the mature cotton red. Many leading mills and cotton brokers now use this test to classify their raw cotton. It makes possible greater operating efficiency and helps the mills to produce cotton textiles of more uniformly high quality. A development of SRRL.

New Milk-Protein Filament for Air Filters and Furniture

During the war, when animal bristles for brushes were hard to get, the Bureau developed a substitute bristle from casein, a protein of milk, intended particularly for paint brushes. The Bureau's process for making casein fiber stiff enough for use as bristle has been adapted by an industrial concern to produce a unique "curled casein filament". This springy, fibrous material is dustless, odorless, and may be colored as desired. It is already being used in a new type carburetor air filter for automobiles, and its unusual resilience makes it suitable for mattress pads and furniture stuffing. A development of ERRL.

Frozen Fruit Spreads Offer Basis for New Rural Industry

Cold-processed fruit spreads, which can be made from berries or various tart fruits, are now in limited commercial production on the West Coast. They contain citrus pectin as a gelling agent and are preserved by freezing. Since the process involves no cooking, the spreads retain all the flavor of the fresh fruit. These new food products are particularly suited for manufacture by cooperative freezing plants. A development of WRRL.

Citric Acid Improves Soybean Oil for Food Products

A small amount of citric acid, added to soybean oil during the deodorizing step of the refining process, makes the oil keep 3 to 5 times longer than soybean oil refined by usual methods. The acid seems to combine with traces of dissolved metals present in the oil and to prevent them from hastening the development of rancidity. Only 3 or 4 ounces of citric acid are needed for a ton of oil. Several commercial refiners are using this method to produce a better soybean oil for margarine, shortening, and salad dressing. A development of NRRL.

Industrial Products from Peanuts

About two-thirds of the South's great peanut crop -- a million tons of peanuts a year, grown on some 4 million acres -- goes into candy, salted nuts, and peanut butter. The rest is crushed for peanut oil or used as high-protein livestock feed. As a result of Bureau research, peanuts now have also a promising market as the source of a new raw material for industry -- peanut protein. This substance makes good adhesives for book bindings, boxes, plywood, and other products; it can be used for sizing paper, to give it the glossy finish needed for high-quality printing; it is suitable for making inexpensive cold-water paints; and it has numerous other uses. The Bureau developed a new fiber from peanut protein that has outstanding possibilities. Commercial production of all these products depends on getting satisfactory protein from peanuts. The peanut meal or press cake produced by ordinary methods doesn't yield protein suitable for industrial use. Too much oil is normally left in the meal; there is no provision for removing the peanut skins, which contain unwanted coloring matter; and the heat involved in the procedure of steaming the peanuts before crushing "denatures" or damages the protein. The Bureau developed a solvent-extraction process for peanuts that overcomes these difficulties. And a method was worked out to get high-quality protein from the oil-free peanut meal obtained by solvent extraction. One new plant in the South, now producing peanut oil and meal by the Bureau's process, is the first potential producer of peanut protein for industry. A development of SRRL.

Antibiotic Produced from Egg White by Bureau Process

Studies by Bureau researchers of the minor constituents of eggs show that some of them may possess medicinal value. One of these substances is lysozyme, a bacteria-destroying enzyme in egg albumin. This antibiotic also occurs in human tears and in the saliva of dogs and other animals -- which probably explains to some extent why animals can help to prevent infection by licking their wounds. The method devised by Bureau scientists for isolating lysozyme from egg white is now being used commercially to produce the enzyme for medical research. This process also makes it feasible to obtain lysozyme from waste egg white remaining in shells discarded at egg-processing plants. A development of WRRL.

Apple Essence Adds Flavor to Candy

When fruits and berries are made into jams, jellies, and other food products, much of their natural flavor is often lost. But manufacturers can now extract the volatile flavor essences from fresh fruits and use them to improve the flavor of their processed fruit products. Practical equipment and methods for recovering and concentrating fruit essences have been developed by the Bureau. At present two companies are marketing a new apple candy flavored with natural apple-essence concentrate produced by the Bureau's process. A development of ERRL.

Improved Process-Control Methods for Pickle Manufacture

If you don't care for sour pickles, maybe you like the dill variety. In either case, these delicacies are made from cucumbers preserved by brining and fermentation. One of the chief headaches of cucumber picklers, especially in the South, are "bloaters" -- hollow, brined cucumbers that are filled with gas and unfit for further processing. In some seasons they cause large losses to the pickle industry. Formation of bloaters is the result of unwanted gaseous fermentation in the brine vats due to certain bacteria and tiny yeast organisms. Bureau specialists found that this type of fermentation occurs most often in brines of high salt content, and that it can be minimized or prevented by adding acid solutions or vinegar to the brine during the pickling process. A number of commercial picklers have adopted this treatment. In the 1948 season it enabled them to avoid losing a large part of their production. Control of bloaters is one of several valuable procedures devised by the Bureau to aid pickle manufacturers. A development of the laboratory for food fermentation investigations at Raleigh, N. C., maintained in cooperation with the North Carolina Agricultural Experiment Station.

Better Bottled Orange Juice

Fresh orange juice of superior quality, prepared and bottled by methods developed through Bureau research, is now being sold in the Los Angeles area and shipped by the carload to a number of Midwestern cities. It has been transported successfully as far as New York. This unpasteurized, refrigerated juice is made from good-quality oranges that are first thoroughly washed and dried. Careful reaming of the fruit insures that very little peel oil gets into the juice. Too much of this oil will hasten development of off-flavors. The juice is then strained, de-aerated, quickly chilled to 30° Fahrenheit, and bottled. Complete filling of the bottles (or other containers) prevents absorption of air by the juice while in storage. Fresh orange juice prepared and packaged in this way and kept under refrigeration at 30° F. will retain good flavor and show no loss of vitamin C for a couple of weeks or more. Since most of the air is removed in processing, the juice should be "re-aerated" before use by pouring it back and forth a few times from one glass to another. Improved processing methods have led to a marked increase in the output of unpasteurized, refrigerated orange juice in southern California. A development of the Los Angeles laboratory.

New Vitamin-C Compounds in Commercial Production

To help meat packers retain their markets for lard in the face of competition from vegetable shortenings, the Bureau has developed methods to make lard keep better. One way this can be done is to treat the lard with levo-ascorbic acid, otherwise known as vitamin C. This is the anti-scurvy vitamin found in citrus fruits and green leafy vegetables. But ordinary vitamin C will not dissolve in lard. So, for the first time, Bureau scientists successfully prepared compounds containing the vitamin that were soluble in fats and could easily be introduced into the lard. The reason lard becomes rancid is that it combines with oxygen from the air. The preserving action of vitamin C is due to its ability to act as an anti-oxidant, or reducing agent -- that is, it combines chemically with the oxygen in the lard, thus leaving less oxygen available to cause rancidity. One of the new fat-soluble, vitamin-C compounds is levo-ascorbyl palmitate. At least one firm is now producing this substance commercially. Besides their use as lard preservatives, the Bureau's vitamin-C compounds, called ascorbyl esters, also have promising possibilities for the manufacture of pharmaceutical preparations containing vitamin C. A development of ERRL.

Quick Handling of Frozen Peas Helps Preserve Their Flavor

Vegetable canners and freezers want to give their customers a product that tastes fully as good as fresh vegetables right out of the garden. Bureau researchers have recently aided commercial packers to turn out better tasting frozen green peas. Their tests show that a major factor causing loss of flavor or development of off-flavors is delay between harvesting the peas and blanching them prior to freezing. Blanching is a scalding process that halts enzyme activity in the peas and helps to prevent flavor deterioration. By changing field and plant practices according to Bureau recommendations, several producers of frozen peas have cut down the time between vining and blanching, and thus markedly improved the quality of their product. A development of WRRL.

Research Increases Production of Potato Flour

With a surplus of potatoes in the U. S. and food shortages abroad, it became highly desirable following the war to step up American potato exports, particularly to Europe. But potatoes are about 80% water and do not keep well in storage. In their natural form they are generally not economical for overseas shipment. One answer to this problem was to convert them to potato flour, which has long been a staple food in Europe. The difficulty here was that our normal capacity for potato-flour production was not big enough to meet the need. It seemed possible that idle equipment available at distilleries and food-processing plants might be put to work making potato flour, but some manufacturers who tried it ran into technical troubles. The Bureau investigated this equipment -- cookers, washers, drum and steam-tube dryers -- and developed methods for using it to produce flour from potatoes. The Bureau specialists took their research results to potential flour manufacturers and showed them how to make the equipment they had work satisfactorily. Partly as a result of this effort, potato-flour production increased last year to a rate of 150 million pounds a year, or ten times the normal output. A development of ERRL.

More Nutritious Cottonseed Meal

Cottonseed provides Southern cotton farmers with a substantial part of their income. The Bureau devotes considerable effort to research on this commodity -- to develop practical solvent-extraction methods for cottonseed; to learn more about the seed's unique pigment glands, which complicate processing; and to improve present methods of converting the seed to oil and meal, using hydraulic and screw-type presses. A new precooking treatment recommended by the Bureau is now helping cottonseed processors to turn out a meal with higher feed value than the meal formerly produced. Cottonseed-oil mills normally heat or cook the seed to make it easier to press out the oil. In conventional methods, water is added to the seed before cooking. But the Bureau found that this practice caused damage to the protein of the cottonseed and made the meal less nutritious as livestock feed. Bureau research showed that in commercial screw-pressing operations little or no water had to be added to the seed before cooking, and that dry cooking gave cottonseed meal of superior feed value. Several cottonseed-processing plants have recently adopted this procedure. A development of SRRL.

New Synthetic Rubber Has High Resistance to Heat and Oil

The Bureau has developed an improved synthetic rubber, Lactoprene EV, derived from lactic acid, a fermentation product of the sugars and starches found in various farm commodities. Lactoprene EV has greater heat resistance than any of the other synthetic rubbers except those known as silicones. It is unusual in that butadiene or similar compounds used in most synthetic rubbers are not required for its manufacture. It is simpler to produce than butadiene rubbers, can be vulcanized without sulfur, and has a number of superior qualities besides exceptional resistance to heat. This new product shows great endurance under repeated flexing, has low gas-permeability, and is unusually resistant to enlargement of cuts, oxidation, and deterioration by oils. One industrial firm began commercial production of Lactoprene EV in September 1948. A development of ERRL.

NAMES OF LABORATORIES AND KEY TO ABBREVIATIONS

The research developments described above are products of the following laboratories. A number of other laboratories and field stations besides those listed are also maintained by the Bureau.

ERRL -- Eastern Regional Research Laboratory, Philadelphia 18 (Wyndmoor), Pa. Dr. P. A. Wells, Director.

NRRL -- Northern Regional Research Laboratory, Peoria 5, Ill. Dr. R. T. Milner, Director.

SRRL -- Southern Regional Research Laboratory, New Orleans 19, La. Dr. W. M. Scott, Director.

WRRL -- Western Regional Research Laboratory, Albany 6, Calif. Dr. M. J. Copley, Director.

Los Angeles -- Laboratory of Fruit and Vegetable Chemistry, Los Angeles 33, Calif. (Now moving to the Bureau's new Research Laboratory at Pasadena, Calif.) Dr. E. A. Beavens, In Charge.

Raleigh -- Food Fermentation Investigations, Agricultural Experiment Station, Raleigh, N. C. Dr. J. L. Etchells, In Charge.